



REMR TECHNICAL NOTE CS-MR-1.8

CONCRETE REMOVAL TECHNIQUE: CONCRETE SPLITTER

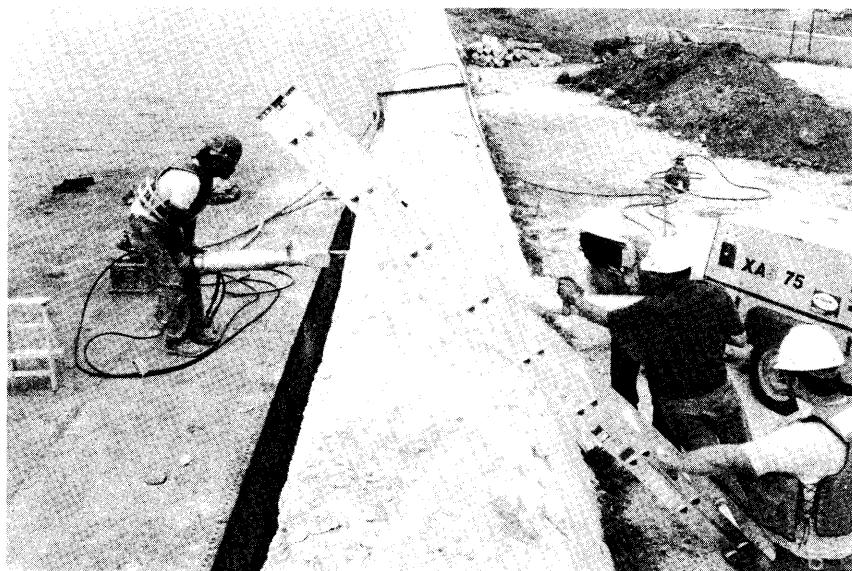


Figure 1. Concrete splitters being used to presplit top of channel wall for removal at Joliet, IL

PURPOSE: To describe the use of the concrete splitter as a technique for presplitting concrete for removal.

APPLICATION: The concrete splitter is a hydraulically driven wedge that is used in predrilled boreholes to propagate crack planes through the full depth of a thick wall or slab to separate sections for removal (Figures 1 and 2). It has been successfully used to presplit concrete for removal from a variety of structures that include bridges (piers), nuclear reactors, bank vaults, and other types of wall and slab structures. It was successfully employed in 1986 at the Corps Brandon Road Dam in the removal of the concrete between gate sluices and at the Corps Joliet channel wall in the removal of the top 2 ft of wall.

The concrete splitter was successfully used in combination with the diamond blade to produce highly controlled removal planes through a 34-in.-thick sub-way wall in Cambridge, MA, in which the middle 10 in. was presplit (Ref a).

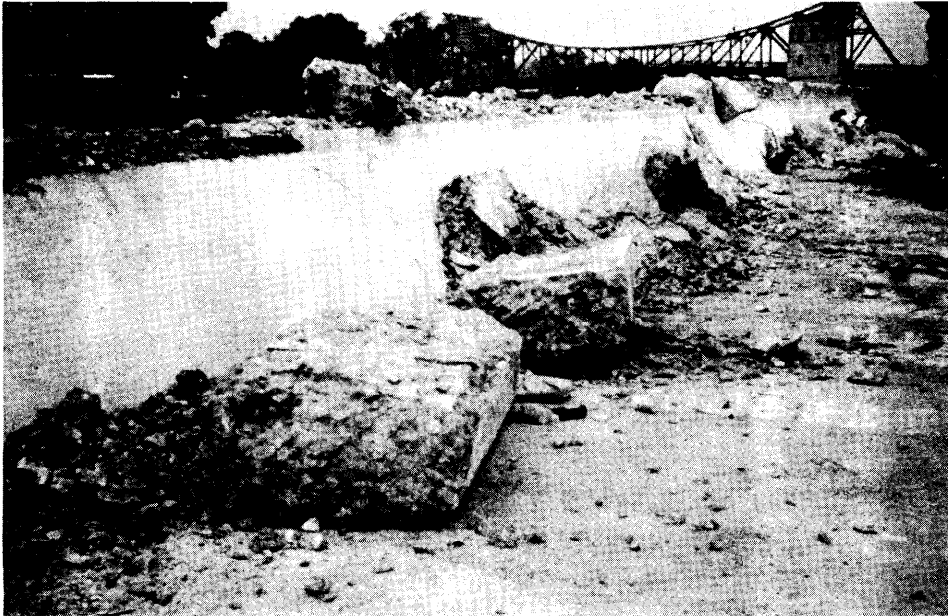


Figure 2. Presplit sections removed from the top of the wall are ready for disposal

ADVANTAGES: The use of splitters may be more economical than diamond blade saw cutting when the depth to be cut is greater than 10 in. For deep removal planes that require saw cutting, the splitter may possibly be used in combination with the diamond blade saw to reduce time and cost of cutting.

The direction of the initial propagation plane is controlled by the orientation of the plug and feathers. No vibration, fly rock, or dust are produced by the splitting operation. Limited noise is produced.

LIMITATIONS: Concrete splitters work best in nonreinforced concrete where planes to be presplit are between 1 and 5 ft in depth. Deeper and better controlled planes can be propagated when splitting is directed from the two opposing faces of a structure simultaneously. Diamond blade saws may be required to provide better control of planes and to prevent feathering at the surface.

Concrete containing steel reinforcement requires special techniques to presplit. During the presplitting operation, shims are required to open cracks sufficiently to allow a torch access to cut the reinforcing. The greater the percent of reinforcement, the more time consuming and costly the presplitting operation. In general, splitters should be considered only for nonreinforced and lightly reinforced concrete.

Predrilled boreholes are generally located to propagate removal planes parallel to a nearby free face and in concrete that is not highly deteriorated. A borehole located in highly deteriorated concrete may result in the local crushing of concrete around the borehole without the propagation of a removal

plane or in the loss of control of the removal plane because of the propagation following existing cracks in the concrete. Boreholes must be drilled accurately with little tolerance for error in diameter, length, and straightness in order to avoid damaging the plug and feathers during presplitting operation and to produce optimum splitting force.

PERSONNEL REQUIREMENTS: Experienced personnel are required to plan borehole detailing, and skilled personnel are required to operate and maintain splitter equipment.

EQUIPMENT: In general, the concrete splitter system consists of a hydraulic pump, hoses, and one or more splitters. The pump motor can be selected as air, electric, or gasoline powered. A special lubricant is required to avoid damaging the plug and feathers and to produce optimum splitting force.

Drilling equipment can be a conventional percussion drill or a diamond core drill when noise and dust must be reduced.

Other removal equipment, such as a hand-held or vehicle-mounted breaker, may be required to complete breakage and increase efficiency in handling and removal.

ENVIRONMENTAL CONSIDERATIONS: A determination should be made as to whether the area to be removed contains coatings or other materials that are considered to be hazardous or toxic. If these are present, proper handling and disposal under Resource Conservation and Recovery Act regulations may be required (see Technical Note EI-M-1.2, "Handling and Disposal of Construction Debris"). Concrete removed may be applicable for placement in open water to serve as a fish attractor reef. Several references are available (Ref b, c, d, and e) that contain suggestions for locating, sizing, and marking fish attractors.

COST: The cost of presplitting concrete varies widely depending on the job. Estimated purchase price for a splitter with accessories would be \$10,000 to \$15,000 depending on the brand and size. Equipment with one splitter can be rented for around \$700/week plus lubrication cost of about \$100/week (estimated use of 1 pt of lubricant per day). An estimated cost for drilling holes for presplitting would be in the range of \$8 to \$32/ft, depending on size of job, makeup and condition of the concrete, and a number of other factors.

- REFERENCES:
- a. Engineering News Record. 1986 (Feb 6). "Congestion Tests Subway Builders," p 20.
 - b. Nelson, R. W., Horak, G. C., and Nelson, J. E. 1978. "Western Reservoir and Stream Habitat Improvements Handbook," US Department of the Interior, Fish and Wildlife Service, Fort Collins, CO.
 - c. Ryder, L. L. 1981. "Concrete Rubble and Miscellaneous Materials as Artificial Reef Material," Artificial Reefs, D. Y. Aska, ed., Report 41, University of Florida, Gainesville, Florida Sea Grant College, pp 89-91.

- d. Shnick, R. A., and others. 1982. "Mitigation and Enhancement Techniques for the Upper Mississippi River System and Other Large River Systems," Resource Publication 149, US Department of the Interior, Fish and Wildlife Service, Washington, DC.
- e. Seehorn, M. E. 1985. "Fish Habitat Improvement Handbook," Technical Publication R8-TP-7, US Department of Agriculture, Forest Service, Southern Region, Atlanta, GA.